A MANUFACTURING OPPORTUNITY IN GEORGI

INDUSTRIAL DEVELOPMENT BRANCH
ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY

PREPARED FOR THE GEORGIA DEPARTMENT OF COMMERCE • JACK MINTER, DIRECT

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SPARK PLUGS

A Manufacturing Opportunity in Georgia

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Foreword

This report is the sixth in the current series being prepared for the Georgia Department of Commerce -- the fourth published report, and the first in the automotive parts field.

One of the unpublished reports, delivered in memorandum form because the potential was so high that we did not want to take additional time to revise the materials for formal reproduction, reported on a product for which a major new plant has already been constructed. Another firm in the same field has informed the Department of Commerce that it plans to build a comparable facility.

Construction of a plant to manufacture still another of the products identified as offering excellent profit potential for Georgia is under consideration by a local development group. An established manufacturer has evidenced strong interest in constructing a plant for the production of still another of the products evaluated.

The response received to this new series and the results already achieved have been most gratifying. We will welcome requests for additional information or for assistance in the selection of one or more locations which would be suitable for the manufacture of any of the products included in the series.

Kenneth C. Wagner, Head
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Summary

Total shipments of automotive and aircraft spark plugs into the six-state southeast region[1/] in 1958 were in excess of $12 million. The combined shipments are expected to increase to over $17 million by 1965. (See Figures 1 and 2.)

A national manufacturer of spark plugs would gain the following major competitive advantages by locating a branch plant in Georgia to serve the southeastern market:

1. A reduction in labor cost per unit of output because of lower wage rates and higher worker productivity in Georgia. (The reduction amounts to approximately 9 per cent based on wage differentials alone.)

2. Improved service to distributors through:
   a. faster delivery of the products;
   b. lower freight cost on incoming shipments; and
   c. smaller inventory investment because of the proximity of the plant to the distributors.

3. Greatly improved sales position in the region as a result of improved service.

Most manufacturers of automotive plugs also manufacture aircraft plugs. The steel bar stock required for the steel shell portion of the plugs is available in Birmingham. The porcelain insulator portion of the product is not presently available in the region, however.

A national manufacturer who produces spark plugs in Georgia for the regional market should considerably increase his sales volume in the area because of the above competitive advantages and would enjoy a significant reduction in production costs.

1/ The region is composed of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee.

THE SOUTHEASTERN MARKET

Automotive Spark Plugs

Shipments of automotive spark plugs into the six-state southeastern area in 1958 were in excess of $12 million and accounted for approximately 12 per cent of national shipments (excluding exports). Total spark plug shipments into the area are expected to exceed $16 million by 1965. (See Figure 1.)

Replacement of worn plugs accounts for the greatest usage in the region. The three major national manufacturers distribute through wholesalers, jobbers and dealers to automotive repair shops. The smaller producers generally distribute through major retail outlets such as Sears, Roebuck and Company or Montgomery Ward, through automotive parts suppliers such as Western Auto Stores, or direct to large consumers such as fleet truck operators.

Competition among the major spark plug manufacturers is based more upon brand preference created among consumers through advertising than upon price. Two of the major producers are subsidiaries of major automobile manufacturers and have a ready-made market through the authorized automobile dealerships of their parent companies. This holds true whether or not the parts are purchased directly from the manufacturer. Thus relatively little direct competition is experienced in this area of the market.

Among the smaller producers, price competition is a greater factor, particularly among those firms servicing the large chain outlets. These retailers, catering to price conscious consumers, are obviously price conscious themselves in their procurement of automotive supplies. Price competition is apparent but to a lesser degree among the small producers, who sell directly to commercial consumers such as the truck lines.

Aircraft Spark Plugs

Shipments of aircraft spark plugs into the southeastern region in 1960 for commercial airline use amounted to approximately $400,000. In addition, a relatively small volume of spark plugs was used in small, privately owned aircraft. The total shipments should approximate $459,000 by 1965. (See Figure 2.)

Most of the plugs shipped into the area are distributed direct from manufacturer to consumer. A small volume of plugs is distributed through aircraft parts suppliers for small aircraft.

Price competition exists to a limited extent in the sale of aircraft plugs to commercial lines. However, the exact extent of such competition is not known.

LOCATION OF MANUFACTURERS

Three companies dominate the field in the manufacture of spark plugs:

Manufacturer	Location
AC Spark Plug Division, General Motors Corporation	Flint, Michigan
Champion Spark Plug Company	Toledo, Ohio Hellertown, Pennsylvania Burlington, Iowa
Motorcraft Division, Ford Motor Company	Ypsilanti, Michigan

In addition, approximately 40 smaller firms, located primarily in the Midwest and New England, contribute to the industry. In the southeastern region, the Scintilla Division of Bendix Aviation in Sidney, North Carolina, is the sole manufacturer of spark plugs.

METHOD OF MANUFACTURE

Most manufacturers make both automotive and aircraft plugs, inasmuch as they require essentially the same operations. A spark plug has three components - a steel shell portion, a center electrode, and a porcelain insulator. The major manufacturers produce the porcelain insulator in a separate plant, shipping it to a plug assembly plant where the steel shell and center electrode are fabricated. The electrode, insulator, and terminal are assembled and sealed, and these in turn are housed in the steel shell and sealed with a sillment compound.

The shells are fabricated from precut steel bars by automatic screw machines which form, drill and ream the shell to the required dimensions. The entire manufacturing operation is highly automated.

The smaller producers purchase the porcelain insulators from specialized spark plug insulator manufacturers. The fabrication and assembly operations are similar to those described above, except that they are not as highly automated.

RELATIVE IMPORTANCE OF LABOR, RAW MATERIAL, AND FREIGHT COSTS

The 1958 Census of Manufactures classifies spark plug manufacture as part of the Engine Electrical Equipment Industry (SIC 3694). Spark plug shipments accounted for 19.5 per cent of the total shipments of the industry for the year.

Labor costs for the industry amounted to 32 per cent of the value of shipments in 1958, with the cost of raw materials accounting for 36.6 per cent. These percentages closely approximate those for spark plug manufacturing alone. Obviously a sizeable reduction in either of these costs would significantly reduce the cost of producing the items.

Freight expenses are a minor portion of the cost of procuring spark plugs.

ADVANTAGES OF A GEORGIA PLANT LOCATION

A Georgia plant affords four major advantages over northern or midwestern locations in serving the southeastern market. Lower production costs would be experienced through lower wage rates and greater worker productivity in the southeastern area. Freight savings would increase profit margins. Customers would receive a service advantage. All of these would result in a better sales position in the Southeast.

Lower Labor Cost

Reduced labor costs are possible in Georgia because of two factors. First, under conditions of good management, worker productivity in the area is very high. Second, the average hourly wage for the category of production workers required for spark plug manufacture is substantially lower. The combination of these two factors would provide a significantly lower production labor cost to a Georgia operator.

Labor Productivity. A Georgia Tech Industrial Development Branch study of labor productivity established several criteria for obtaining the maximum productivity from Georgia workers.[1/] An informed management, good personnel policies, utilization of local personnel in supervisory positions, reasonably stable production, and participation by the management in community activities are among the prerequisites needed to obtain high employee performance. By satisfying these conditions, a company which establishes a Georgia plant can expect very high productivity from its employees. As examples of what can be achieved in this area by utilizing these principles, national manufacturers of such a range of products as automobile parts, foundation garments, and paper products have found that their Georgia plants are significantly more productive than any of their other operations.

Wage Differential. The average 1958 production wage rate for the Engine Electrical Equipment Industry in the United States was $2.33 per hour. The rates for selected states were as follows:

1/ See Charles Sewell, A Formula for Labor Productivity in Georgia, July 1961.

Ohio	$2.49 per hour
Michigan	2.47 per hour
New York	1.93 per hour
Georgia	1.50 per hour

Ohio and Michigan now produce a very high percentage of all spark plugs made in the United States.

The ratio of value of shipments to total production man hours for the industry in 1958 was $10.49 per man hour. This ratio would undoubtedly apply to spark plug manufacture as well as to the entire Engine Electrical Equipment Industry. Therefore, an Ohio manufacturer whose present annual shipments into the Southeast region amount to $3,000,000 would reduce his annual production costs $283,127, based on the above wage differential alone, by producing the items in Georgia. This reduction was computed as follows:

Number of production man hours required (for above sales volume) =

$$\frac{\$3,000,000}{\$10.49} = 285,987 \text{ man hours}$$

Reduction in annual production wages (based on above wage differential) =

($2.49 - $1.50) (285,987) = $283,127

This amounts to a 9.4 per cent reduction from the value of shipment figure of $3,000,000. The percentage reduction in the manufacturer's cost would be somewhat greater than this figure.

Lower Freight Cost

As an example of the potential freight cost reduction, the commodity freight rates[1/] from a plant located in Atlanta to six southeastern cities are compared below to commodity freight rates from plants located in Flint, Michigan; Toledo, Ohio; and Ypsilanti, Michigan, to the same locations.

1/ Commodity rates from Atlanta are estimated from class rates furnished by local railway agents.

Rail Freight Rates for Shipping Spark Plugs
(40,000# minimum weight except as otherwise indicated)

Destination	Origin Atlanta	Flint	Toledo	Ypsilanti
Atlanta	.42	1.70	1.56	1.62
Birmingham	.80	1.70	1.56	1.64
Charlotte	.98	1.75	1.59	1.67
Jacksonville	1.08	2.09	1.78	2.01
Memphis	1.50*	2.20**	2.04**	2.11**
Miami	1.95*	3.38**	3.22**	3.30**

* Class rate for 22,000# minimum
** Class rate for 24,000# minimum

Based on the above rates the percentage reduction in freight from the Atlanta plant compared to the Flint plant would be 48.3 per cent, while the reduction compared to the Toledo and Ypsilanti plants would be 42.7 per cent and 45.5 per cent respectively. The freight cost from the Michigan and Ohio plants to the Southeast amounts to approximately 0.75 per cent of the value of shipments into the area. The reduction in freight cost available to an Atlanta plant compared to any one of the above plants whose shipments into the region total $3 million annually would be as follows:

Reduction in freight over Flint plant = $10,800 annually
Reduction in freight over Toledo plant = $10,200 annually
Reduction in freight over Ypsilanti plant = $ 9,600 annually

Improved Service to Customers

A plant located in Georgia would greatly improve service to distributors of automotive spark plugs and to large users of aircraft plugs in the region. Because of the shorter shipping distance between manufacturer and distributors, the latter would enjoy the lower freight cost and prompter shipping service described above, plus a substantially reduced inventory. The reduced freight charges and inventory investment available to the distributor could be expected to stimulate the distributor to promote the sale of the locally manufactured brand, since it would be a higher profit item.

The large buyers of aircraft plugs in the area would similarly obtain lower freight costs and faster delivery of the product. These advantages alone should increase the sales of a locally manufactured brand.

Better Sales Position in the Southeast

The combined advantages of lower freight cost to the customer and better customer service, as described above, should significantly improve a national manufacturer's sales position in the region.

CONCLUSIONS

From the market data revealed in this report, it is apparent that a large southeastern market exists for spark plugs. The regional market for automotive type plugs comprises approximately 12 per cent of the national market for the product.

It is also evident that significant competitive advantages exist for any prospective Georgia plant. The most important of these assets are the substantially lower labor costs for a given production output, greater customer service, and a more competitive sales position in the area.

Because of the size of the southeastern market for the product and the important competitive advantages of manufacturing in Georgia for that market, existing national manufacturers could expect to profit from the manufacture of spark plugs in this state.

APPENDIX 1

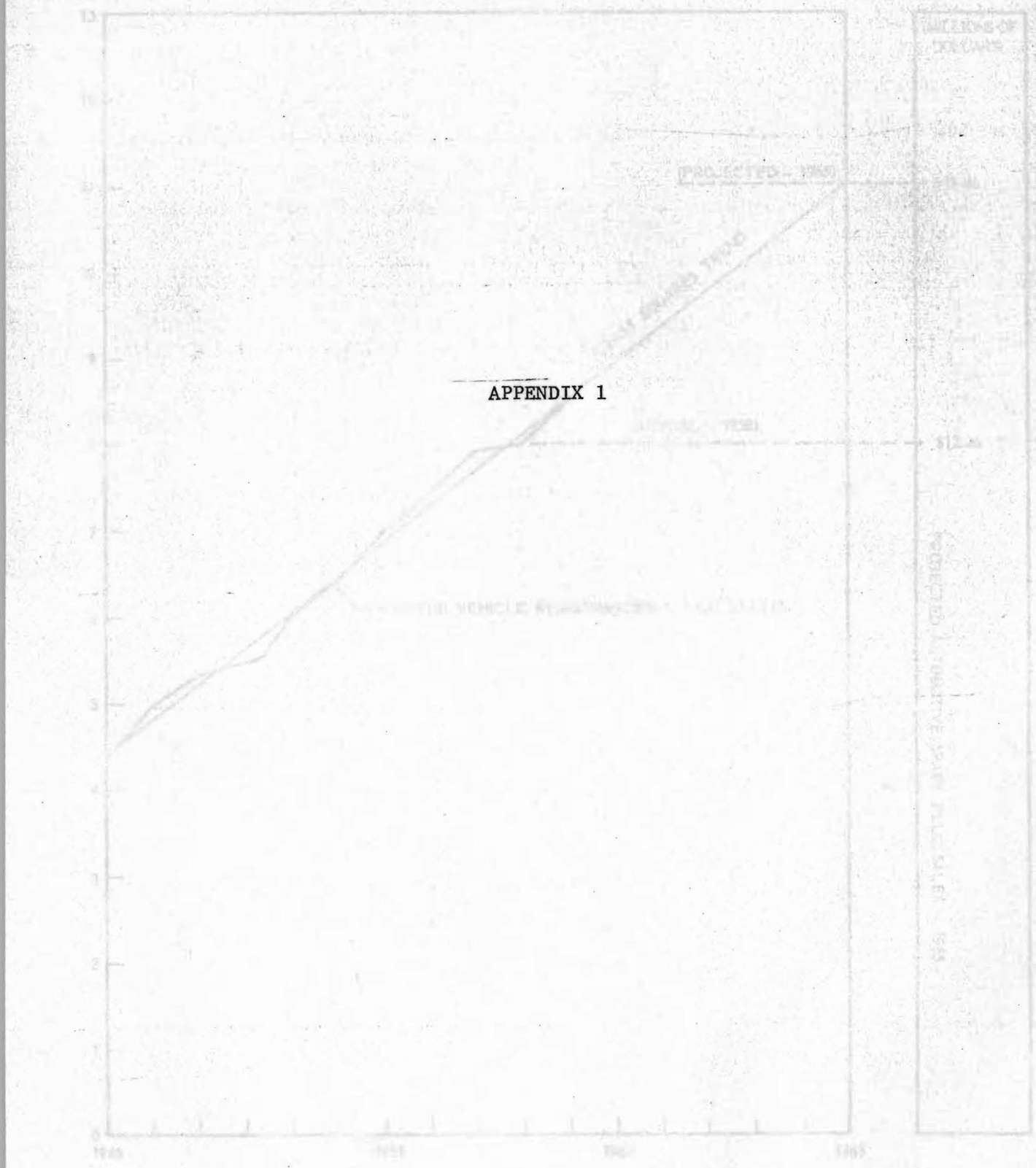


FIGURE 1
SALES TREND – AUTOMOTIVE SPARK PLUGS

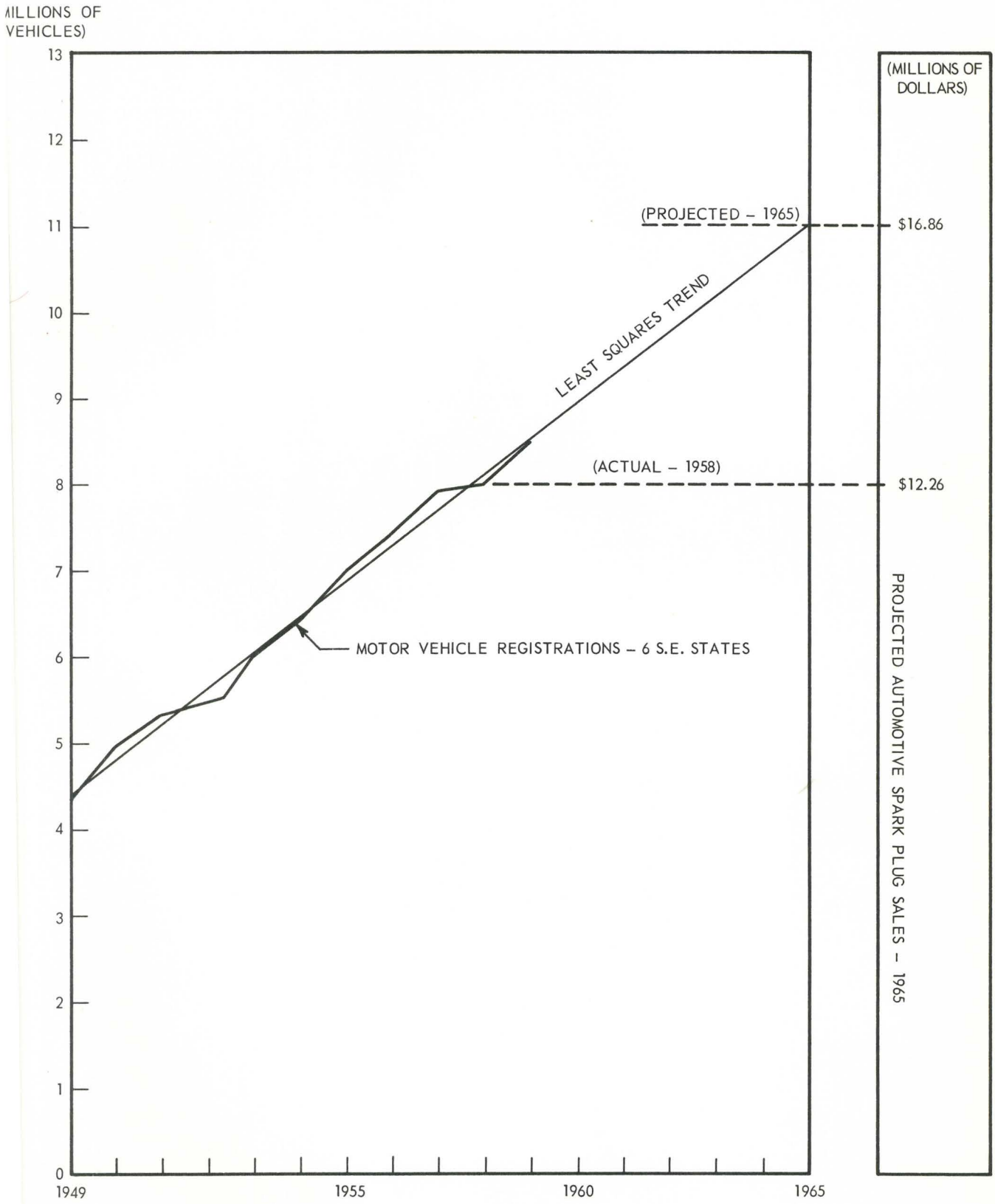
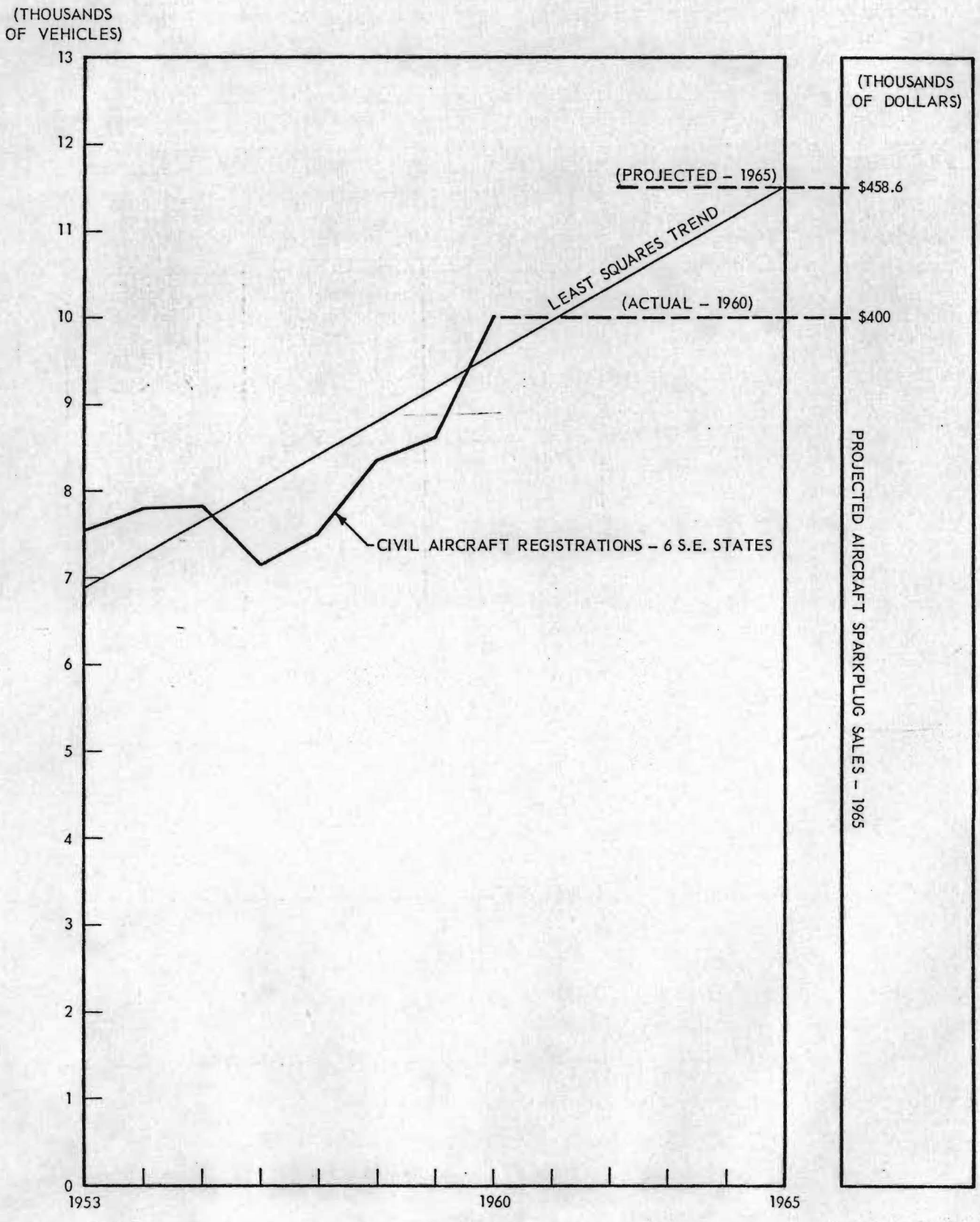


FIGURE 2
SALES TREND – AIRCRAFT SPARK PLUGS



APPENDIX 2

DATA COLLECTION

Automotive Spark Plugs

The value of U. S. shipments for 1958 was obtained from Automobile Facts and Figures, 1959-60 edition, published by the Automobile Manufacturers Association. This publication's data on spark plugs were obtained from U. S. Bureau of the Census figures.

The value of shipments into the six-state southeastern region in 1958 was obtained on the basis of total automobile registrations in the area by the following formula:

$$\frac{\text{1958 Automobile Registrations - 6 S. E. States}}{\text{1958 Automobile Registrations - U. S. (excluding exports)}} \times \text{U. S. Shipments of Spark Plugs} =$$

$$\frac{8,159,301}{68,299,408} \times \$102,655,000 = \underline{\$12,263,680}$$

1965 value of shipments was determined by using the computed least squares trend of automobile registrations in the region as the trend for spark plug sales. This trend was applied to the 1958 value of shipments figure and the 1965 value was projected from the trend line (see Figure 1).

Aircraft Spark Plugs

Sales of the product in 1960 were determined from a questionnaire survey of major aircraft overhaul facilities in the Southeast. This survey was conducted by Georgia Tech's Industrial Development Branch.

1965 sales were estimated by using the computed least squares trend for civil aircraft registrations in the region as the trend for aircraft spark plug sales. This trend was then applied to the 1960 actual sales figure and 1965 sales were projected from the trend line. (See Figure 2.)